

A Smart Reader for Visually Impaired People by Using Raspberry Pi

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Abstract

This paper proposes an intelligent text reader using python. This product is built on a Raspberry Pi module connected with a camera that is used to capture the input image. The input image is enhanced using Image processing techniques. The Tesseract OCR (Optical Character Recognition) engine embedded in the Raspberry Pi searches for the text in an improved image and converts it into a digital document. The digital document is then analyzed using the semantic check module. After the analysis, the text is converted to speech by a Python-based TTS (text to speech) conversion unit embedded in the Raspberry Pi. Finally, the audio output is given to the Audio Amplifier for it to be readout.

Index Terms- Optical Character Recognition, Raspberry Pi, Tesseract, Open Source, Espeak, Python programming, Voice output.

Introduction

There are millions of visually impaired people. According to World Health

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Organization (WHO) data on visual impairment, at least 2.2 billion people have Some kind of vision impairment. Visually challenged/disabled individuals are not able to read printed documents, except for those Documents which are converted into Braille by clear-sighted people.

Keeping in mind the problems faced by these people, we proposed a system, it is workable for the conversion of Image Text to speech with light-sensing. There are two major steps a) Extraction of text from the image, then save it into another separate text file, and b) converting the speech output in the English language

Tesseract is an OCR engine that supports Unicode and can recognize more than 100 languages. The Tesseract library yields text from the image. Text extraction is the conversion of the information/text which is Carried out by Pytesseract-OCR which is a library and it consists of 2 major steps i.e. pre-processing and post-processing where extraction, segmentation, and recognition take place where the final information is

received which is then converted into speech or audio output by using different speech engines such as gTTS, E-Speak though gTTS is more accurate than TTs.

Related Work

A lot of research is going on associated with virtual text readers which have made it necessary for the virtual reader to be automated, efficient, and affordable. This virtual reader becomes friendly to visually impaired people.

Screen Reader is used to helping blind and also visually impaired people. It helps to read the text aloud that is displayed on the monitor of an image that is captured through an image sensor that is connected to mobiles, computers, tablets, or other devices. A text to speech synthesizer helps to produce speech of corresponding text, it gets information from the screen and the speech synthesizer recognizes. A text to speech engine software is embedded with the screen reader in this technology [1, 3].

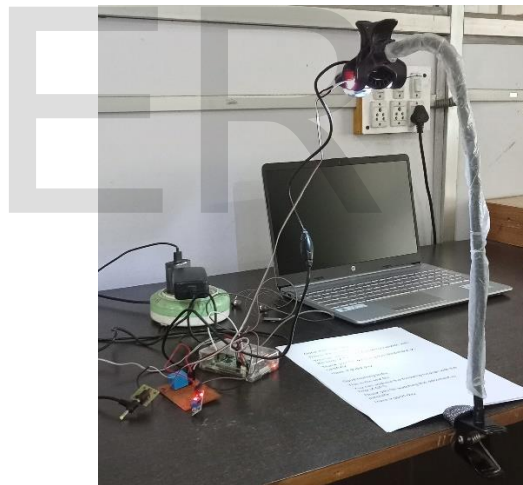
An E-Book Reader or Audio Book Reader which is accessible for laptop or mobile, that can examine the text louder from their screen to BVI, which helps to read the e-book that appeared on the display screen with a touch display gesture and it performs this job by using textual content to speech function.[5]

Blind Reader can be capable to study electronic documents. Through this, a reader can clearly understand and go through the substances correctly by using the usage of the feel of touch. The blind reader is an application. It is developed for android gadgets. The person has to cross his fingertip horizontally from left to right on the android cellular display screen and the phrases that are touched are studied out through a speaker which is built-in with the cellular device. In this software, the record is considered as a

series of phrases so that the gadget can recognize the touched phrase accurately. For visually impaired humans the total facts on the display are now not clear will no longer be visible by them. [7]

A smart reader for visually impaired people using Raspberry Pi is presented. This work recommends a reading system mainly for visually impaired people. The character recognition is carried out using image processing techniques on an input image provided by the camera. The text is then converted into speech using a TTS synthesizer. The system here is built using MATLAB. [8]

Block Diagram



System Requirement

The system contains a Raspberry Pi 3 B+, SD card, Speakers, Power supply, Webcam, and internet connection made through Wi-Fi

A. Raspberry Pi 3 B+

The raspberry pi is a single-board computer that can perform various functions. In the

proposed system all the computational tasks are done by the Raspberry Pi board.

B. Operating System-

Raspbian OS is a Debian-based computer operating system for Raspberry Pi.

C. Language-

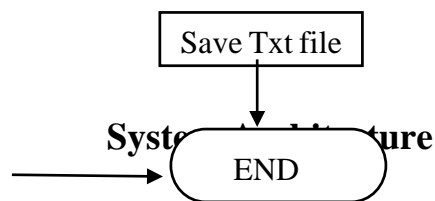
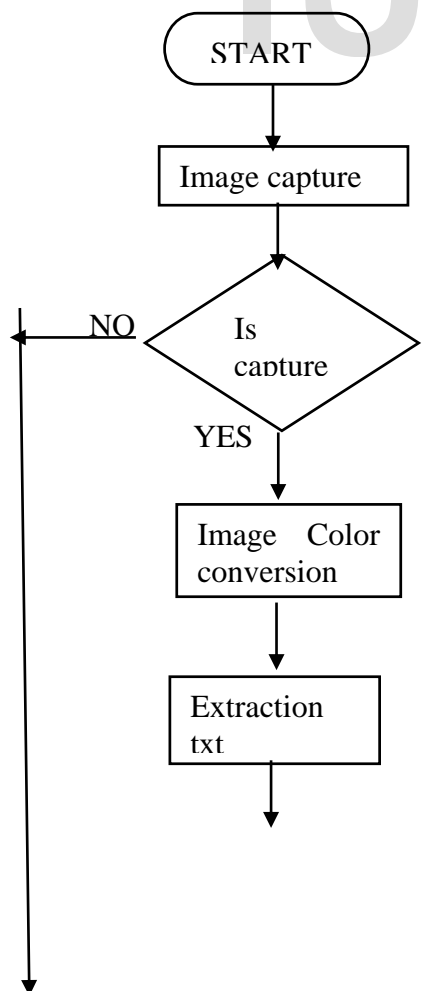
Python is a well-defined object-oriented programming language for general-purpose programming which was created by Guido van Rossum and first was released in 1991.

D. Library-

Tesseract-OCR, Pillow-PIL, gTTS, play sound.

E. IDE-

Python 3.5 has its IDE (Integrating Development Environment) which has a various variety of packages like image processing, scale plotting, Text processing, and other different packages which are present as default in it.



A. OCR module-

OCR is a task that consists of extracting text from images. With the help of a digital camera, OCR technology is widely used for data reading. OCR pre-processes images to improve the chances of successful recognition. The text is recognized by the Tesseract library in segments or parts. This is the character recognition part it is done by training and testing, it will compare the text with vector and find the closest match.

B. TTS module-

TTS is a technique that converts text into voice output. It will read aloud the text document, such as a help file, Web page, novels, product labels, or instructions at a public place. In our project, we will use Espeak. When we combine OCR and TTS it can function as a reader machine of the document that we present in front of the camera.

Conclusion-

In this paper, we have proposed a system that acts as an aid for enhancing the quality of one's life. This project is made on various platforms like a python with its various packages which are programmed and run on Raspberry Pi 3B+ model. By implementing this system we are performing image to text to speech conversion with sensing the light effect.

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